Journal of the Society of Arts.

FRIDAY, OCTOBER 10, 1862.

INTERNATIONAL EXHIBITION OF 1862.

DISTRIBUTION OF MEDALS AND AWARDS.

The following notice has been issued :—" His Royal Highness the Prince of Wales, being anxious to mark his deep interest in the success of the International Exhibition, an enterprise which owed its origin to his beloved father, has, with the approbation of her Majesty, graciously undertaken to distribute the Medals and Certificates of Honourable Mention, at a State Ceremonial early in the year 1863, after the building has been cleared."

REPORTS OF THE JURIES.

The Council of the Society of Arts have felt the importance of having some permanent and authoritative Record of the International Exhibition, and finding that Her Majesty's Commissioners have provided only for the publication of the awards of the Juries, but not of their Reports descriptive of the Progress of Industry since the Exhibition of 1851, the Council have undertaken this work, with the co-operation of Her Majesty's Commissioners and of the Juries, and have placed the matter in charge of Dr. Lyon Playfair, the Special Commissioner of the Juries.

The Reports will be published in super royal octavo, to range with the one-volume Jury Reports of 1851. The price of the volume, bound in cloth, to Members of the Society of Arts, to Jurors, and Guarantors, is fixed at 10s. ; to other persons, 15s. If bound in morocco, 7s. 6d. additional in each case.

Forms of application for copies have been issued to Members of the Society, to Jurors, and to Guarantors.

It was the intention of the Council to issue the volume complete in the early part of September, but as several of the Reports have not yet been received by Her Majesty's Commissioners, the completion of the entire work has been unexpectedly delayed; the Council, however, unwilling to defer the publication of the Reports already completed, have issued to the subscribers those that have been received up to the present time. When all the Reports are delivered, the parts now issued to subscribers will be exchanged, if uninjured, for the perfect volume, bound or unbound, as desired. Individual reports are sold separately; for prices see advertisement.

INTERNATIONAL EXHIBITION OF 1862.—Visits of Schools.

The following is a continuation of the Schools reported to Her Majesty's Commissioners as having entered the Building, from the 29th September to 2nd of October, 1862 :—

Date.	From what Locality.	Name of School.	By whom Sent.	No. of Children from each School.	Total each day.
Sept. 29	Harlaston, Lincolnshire	Choir	Rev. G. E. Norris	15	
„ „	Clapton, N. E.	St. John's Foundation	Committee	55	70
„ 30	Westminster-road	Asylum for Female Orphans	Mrs. John Burnett	39	
„ „	Sloane-street, Chelsea	Industrial Home	Subscription	47	
„ „	Tottenham	Bruce Castle	A. Hall, Esq.	26	
„ „	Brixton-oval	Bedford House	The Principal	8	
„ „	Aldham Rectory	Charity	Rev. C. Bannatyne	24	
„ „	Margate	Holy Trinity Church	Committee	40	
„ „	Cromhall, Gloucester.	Earl Ducie's (Middle)	Subscription	15	
„ „	Margate	St. John's	Subscription	60	
„ „	Hendon	Mill Hill, Grammar	Rev. Dr. Hurndall	35	
„ „	Chessington, Surrey	National	G. W. Clark, Esq.	36	330
Oct. 1	City of London	Tower Ward	Committee	61	
„ „	Old Gravel-lane	Wesleyan Day	Messrs. J. Lidgett & Son	85	
„ „	TanridgeCourt, Surrey	Oxstead, Sunday	Lady Melville	21	
„ „	Rotherhithe	National	Rev. E. Blick	19	
„ „	Kelvedon, Suffolk	Feering House	Mrs. Beardwell	6	
„ „	Wokingham, Berks	National	Subscription	24	216
„ 2	Borough-road	British and Foreign School, Society's Training College (Male Students)	Samuel Gurney, Esq., M.P.	94	
„ „	Stockwell	British and Foreign School, Society'sTraining College(Female Students	Henry E. Gurney, Esq.	92	

RETURN OF SCHOOLS (*Continued*).

DATE.	FROM WHAT LOCALITY.	NAME OF SCHOOL.	BY WHOM SENT.	No. of Children from each School.	Total each day.
„ „	Deptford	St. John's (Teachers)	The Managers	19	
„ „	City of London ...	St. Sepulchre's	J. Holby, Esq.	30	
„ „	Kennington	Bolton-street	Individual Subscription ...	10	
„ „	Anerley	Surrey, North	Mrs. Vignoles	7	
„ „	Stockwell-green ...	British	Mr. Goodchild	10	
„ „	London	St. Giles's National	Rev. A. Thorold	255	
„ „	Covent-garden	St. Paul's	Mr. Howard	17	
„ „	Lambeth	St. Andrew's, National	Subscription	161	
„ „	St. George's-road, Southwark ...	King Edward's...	The Governors...	21	
„ „	Wimbledon, Surrey...	Sunday	Subscription	50	
„ „	Lewisham, Kent ...	St. Mary's...	Subscription	30	
„ „	Hampstead	Haverstock Sunday	Rev. E. Diver	10	
					806

VISITS OF WORKMEN.

The following is a continuation of the return of the number of workmen, mechanics, operatives, and others who have visited the building from 26th September to October 2, 1862 :—

DATE.	DESCRIPTION OF PERSONS.	FROM WHAT LOCALITY.	BY WHOM SENT.	NUMBER.
Sept. 25	Agricultural Labourers	Grove-hill Farm, Tingewick, Bucks	H. P. Greaves	20
„ 29	Farm Labourers	Oldfield, Oxon	Mr. Wm. Treadwell	16
„ „	Agricultural Labourers	Burton, Latimore, Northamptonshire) ...	John Walker, Esq.	14
„ „	Employés	Mustard, Starch, and Blue Works, London and Norwich... ..	Messrs. J. and J. Colman ...	500
„ „	Glue and Size Makers	Bermondsey	Proctor and Bevington	107
„ 30	Farm Labourers	Broughton House, Northamptonshire ...	Duke of Buccleuch	50
„ „	Brewers' Employés	Romford, Essex	Ind and Coope	450
Oct. 1	5th Company 4th City Rifle Volunteers	City of London	Captain H. T. Swatton ...	20
„ „	Engineers and Agricultural Implement Makers	Reading, Berks...	Messrs. Barrett, Exall, and Andrews	500
„ 2	Ship Builders' Apprentices	Southampton	John Ransome	47
„ 3	Brewers	Stanmore, Middlesex. ...	T. Clutterbuck	14
„ „	Inmates of Shoreditch New Almshouses	Haggerstone	C. S. Butler, Esq., M.P. ...	19

CONVERSAZIONE.

The third Conversazione of the season took place at the South Kensington Museum on Wednesday evening, the 8th instant. There were upwards of 3,000 persons present, including some of Her Majesty's Commissioners for the Exhibition of 1862, Foreign Ministers and Commissioners, Jurors, and others connected with the Exhibition. The company was received by Sir Wentworth Dilke, Bart., Vice-president, and other members of the Council. The bands of the First Life Guards and of the Coldstream Guards were in attendance.

ON ARTIFICIAL STONES.

BY PROFESSOR D. T. ANSTED, M.A., F.R.S.

The following paper was read in Section G at the Cambridge Meeting of the British Association :—

The various compositions that have been invented from time to time to replace natural stone, by substances cheaper, more convenient, or more durable than any that can readily be obtained on the spot where the stone is required, are so numerous that it would be impossible merely to name them without occupying much time; and a mere enumeration could have little or no interest. My object in the present communication is to direct the attention of the section to the different classes of material that have been found available; to point out the principles involved in each, and the special advantage and disadvantage each possesses, to refer to a new and I believe an important material, and to suggest the bearing of the whole subject on that of the preservation of stone from decay. Having for several years, and especially during and since the Exhibition of 1851, taken great interest in the subject of constructive material and the preservation of stone, and having lately been one of a committee of inquiry concerning the state of the stone of the Palace at Westminster, I have learnt from experience how little the whole subject is understood, how vague are the notions of intelligent practical men—builders as well as architects—and how difficult, if not impossible, it is for architects, engineers and builders to determine, by any series of experiments lasting only for a short time, whether a method proposed is likely to have any practical value when applied on a large scale.

The artificial stones hitherto used may be grouped

under one of three heads—they are either (1) *terra cotta*, or manufactures of plastic clay burnt in a kiln; (2) *cements*, manufactured from a certain kind of limestone containing foreign ingredients of such a nature that when converted into lime by burning, the lime thus made possesses the property of setting very rapidly and firmly when wetted; (3) *siliceous stone*, obtained by burning in a kiln sand and other substances moulded with a solution of silicate of soda, which is converted into a kind of glass firmly connecting the particles. I omit *plasters*, as rarely exposed to the weather.

Terra cotta.—The advantages of this material are (1) its cheapness and the abundance and the universal distribution of the clays of which it can be made; (2) the facility with which it can be moulded to any required form; and (3) the pleasant colour of the material when uninjured by long exposure to weather. The work recently executed at the Horticultural Gardens at South Kensington, is a favourable specimen. The disadvantages of terra cotta are (1) the uncertainty of the result, owing to the great and unequal contraction of all clays in burning; (2) its want of power to resist damp and frost whenever there is the slightest flaw, whether produced before or after burning; (3) its brittleness and want of strength; (4) its exposure to a disagreeable green vegetation in damp air after a few years weathering. Terra cottas are better adapted to a dry than a moist climate.

Cement.—Whether of the kind called Puzzolana, Roman, or Parker's, or Atkinson's, or any modification of these,—all the cements are similar in their nature. The advantages of cement used as an artificial stone are (1) its cheapness where made, and its ready transport; (2) its not requiring the kiln, but setting at once without contraction; (3) the facility of moulding and making up the material from the manufactured cement supplied; (4) its great strength when well made. The disadvantages are (1) that it cracks and peels badly when exposed to frost and damp air; (2) that it is very irregular, some samples yielding a much harder, better, and more lasting stone than others, without apparent reason; (3) that it is subject to a green vegetation, like terra cotta. These disadvantages do not all apply to its use in making concrete, for which it is admirably adapted.

Siliceous Stone.—This is manufactured under a patent by Mr. Ransome. It attracted attention at the Exhibition of 1851, and has since been much used. Its advantages are: (1) the extreme uniformity of its texture; (2) the almost entire absence of contraction, and its freedom from cracks and flaws produced during burning; (3) its complete resistance to all kinds of weathering, to which may be added (4) its pleasing colour and tint.

On the other hand, among the disadvantages are (1) its cost, which is greater than for either of the other kinds of artificial stone; (2) its being subject to a white efflorescence of salt and a green stain from damp, both of which take away from its value for ornamental purposes, for which it is otherwise admirably adapted.

The mechanical and chemical principles involved in these different contrivances are as follows: in terra cotta the material is a kind of clay purer and more free from foreign substances than common clay, and mixed with dust from pottery already made. The manufactured article is thus a superior fire brick. The burning produces little chemical change or metamorphosis, but the condition after burning is so far different that ordinary exposure will not bring back the original texture of clay. Of closer texture than brick, there is less absorption from the surface; but in ornamental work there are always flaws enough to render frost following rain dangerous and injurious. In other respects the material itself is little more liable than brick to injury from exposure.

In cement the raw material is carbonate of lime, with a certain but variable proportion of foreign substances, of which clay or silicate of alumina is an important and even an essential part. All the varieties of cement stone, such as the stones called septaria and other nodules, in the London clay at Harwich, or the Kimmeridge clay in Dorsetshire, or the Lias in the Midland Counties and the north, or the mud of the Medway and Thames, agree in this. On burning this material the limestone is converted into lime, and the condition and proportion of the foreign material determines the value of the resulting cement. It is called *hydraulic cement*, as setting with almost any required rapidity when properly mixed with water, and this in damp air, during rainy weather, and even under water, absorbing no more water than is necessary for consolidation. Under various names, *pozzuolana*, *Roman cement*, *Parker's cement*, *Atkinson's cement*, &c., this valuable material has been used from time immemorial, and is especially adapted for making concrete where a large proportion of foreign substances is introduced. As an artificial stone, although it hardens on exposure, its composition is too irregular to justify a very extended use. In the process of *setting*, the lime first mixes with water and becomes hydrate of lime, and is then rapidly converted into silicate of lime, adhering strongly in thin films to itself and to foreign bodies with which it is in contact.

The siliceous stone of Mr. Ransome consists of sand and foreign substances, worked up into a paste with the fluid silicate of soda. If left to dry in the air it would fall to powder, but being exposed to a high heat in a kiln a chemical action takes place. The alkali of the silicate of soda "combines with an additional quantity of silica supplied by the sand, &c., with which it is incorporated, and becomes converted into an insoluble glass, firmly agglutinating all the various particles together into a solid compact substance." No sensible contraction takes place in burning, and cracks rarely occur.

The resistance to weather offered by these three kinds of artificial stone may be thus stated:—1. Terra cotta, contracting irregularly in the kiln, is subject to cracks and flaws, into which water penetrating and expanding during frost, a peeling and splitting of the material naturally follows. It is almost certain, from the nature of the case, that delicate and ornamental work should be more liable to such injury than straight work and plain surfaces. 2. Cement, owing to the want of homogeneity in the raw material, is also very subject to flaws and cracks, and is injured by damp and frost like terra cotta. Both terra cotta and cement require painting in London and elsewhere. 3. The siliceous stone is rarely flawed in the kiln, but even if it is, the stone does not crack, or the surface peel by exposure to damp and frost, owing to the nature of the cement, which is, in fact, glass. It is also worthy of remark, that this material obtains its greatest hardness before it leaves the kiln, whereas cement gradually hardens, and continues to harden for many years if it be not destroyed before the induration is sufficiently advanced.

During experiments made in the laboratory on various methods suggested for preserving stone by a section of the committee recently appointed by the Board of Works in reference to the palace at Westminster, Dr. Hoffman, Dr. Frankland, Mr. Abel, and myself being members of this sub-committee, a very remarkable material was submitted by Mr. Ransome and experimented on to some extent.

Dr. Frankland has since reported on this material. Its discovery arose out of the application of Mr. Ransome's method of preserving stone by effecting a deposit of silicate of lime within the substance of absorbent stones:—Mr. Ransome saturating the surface with a solution of silicate of soda, and then applying a solution of chloride of calcium, thus producing a rapid double decomposition, leaving an insoluble silicate of lime within the stone, and a soluble chloride of sodium (or common salt), which could afterwards be removed by washing. To prove that by this process a coating of hard silicate of lime was actually formed and deposited, as according to his theory it must be, Mr. Ransome made small blocks of various forms, in moulds, by mixing loose sand with the fluid silicate of soda, and then dipping the mould into the chloride of calcium. To the surprise probably at first of Mr. Ran-

some himself, but certainly of the chemists of the sub-committee, who performed the experiment in the absence of the inventor, there came out almost instantaneously a perfectly compact, hard, and to all appearance a perfectly durable solid. In such solids, at least, there seems to be no element of destruction.

It was evident that such a result could not be without consequences. So far as it bore upon the inquiry of the committee, it is alluded to in their published report. Many considerations connected with the nature and condition of natural stones liable to destruction by weathering prevent an absolute decision without much previous experience. Mr. Ransome, however, immediately patented his "*concrete stone*," and as an artificial stone it deserves to be well known and thoroughly considered. It promises indeed to combine the advantages, and seems to show none of the disadvantages, of other artificial stones. It is cheap, being made of almost any rubbish on the spot where it is required, by the aid of materials neither costly nor difficult to convey. It is made with rapidity, and is ready for use without drying or burning. It hardly requires even a temporary shed for the purposes of manufacture, and may be made of any size, and moulded into any form. So far as can be detected, it is subject to no injury from weather, and becomes, in fact, if made with sand, a true sandstone, cemented by silicate of lime, than which there is no better natural material. No doubt it will be necessary to watch carefully for a few years the behaviour of a silicate of lime thus deposited, but if it endure that test there can be no doubt that it will then improve by time, increased age only hardening all known silicates of lime, especially those formed from lime used as mortar or cement.

In the application of this subject to the preservation of stone, there seems a probability that some valuable result will follow from the suggestion of Mr. Ransome, to effect the deposit of an insoluble silicate within the pores of an absorbent stone by double decomposition. The objection, strongly felt, that the material thus deposited would probably be in the form of unconnected grains, rather than a cementing film, seems answered by the formation of a stone so solid as the specimens show; and although it is unlikely that any contrivance can render absolutely permanent a stone that has once advanced far in decay, it will be a great step gained if poor and doubtful stones can be rendered almost indestructible before being placed in a building and exposed to danger.

So far as artificial stone is concerned, Mr. Ransome's material, if it really shows no unexpected weakness, will answer all requirements. It has been tried on a somewhat large scale in the bed of a steam engine, weighing two tons, in the International Exhibition, and again in the new stations recently erected for the Metropolitan Railway. Smaller specimens are very satisfactory. It seems to combine cheapness with durability and resistance to weathering to an extent hitherto unknown.

I append the following results of experiments recently made, and communicated to me by Mr. Ransome:—

Compared with Portland and Caen, a bar of the concrete stone, the section being 4 inches square and length 8 inches between the supports, sustained 2,122 lbs. suspended midway between the supports; while Portland and Caen broke at 750 and 780 lbs.

The adhesion of the stone is shown by weight suspended from a piece prepared to express a sectional area of $5\frac{1}{2}''$. Caen stone separated at 768; Bath at 796; Portland at 1,104; Elland edge at 1,874; and Ransome 1,980 lbs.

A cube of 4″ sustains 30 tons.

UNSINKABLE SHIPS.

By Charles Atherton, late Chief Engineer in Woolwich Dockyard.

The following paper was read in Section G., at the Cambridge Meeting of the British Association:—

Competitive rivalry in the arts of naval construction and Ordnance destruction, as applied to maritime warfare, having now, as appears by recent demonstrations at Shoeburyness, reached a condition of experimental speculation prospectively of an unlimited character; and as the consideration of this subject essentially embraces the question of the capability of an invulnerably armoured ship to carry armament with reference to the size of the ship itself, it is presumed that a paper thus involving the details of Naval architectural construction may be appropriately brought forward and discussed in the Mechanical Section of the British Association for the Advancement of Science.

The object of this communication is not to discuss the question—Whether, by an unlimited expenditure, ships can be made invulnerable to the assaults of all present and future ordnance, nor is it intended to damp the ardour with which peace must be upheld by the moral effect of preparation for any adverse eventuality by our practically adopting, for the time being, in common with other nations, the recognised principle of "invulnerability." My object on the present occasion is simply to bring forward the question, whether the principle of "Unsinkability" as based on the average specific gravity of the materials of which a ship may be constructed and loaded being less than the specific gravity of water, and as distinguished from "invulnerability" as dependent on armour plating, may not be advantageously introduced as supplementary to our present system of naval construction.

This subject has for some years engaged my attention, and in anticipation not only of the now-realised efficacy of direct fire, but also in anticipation of a totally new era of mortar practice not yet entered upon, whereby the decks of vessels may undoubtedly be assailed by the descent upon them of a huge weight (say 10 tons), projected to a great height (say 300 feet) at short range (say 100 yards), thereby attaining precision of descent, and falling almost vertically on the deck, and passing out through the bottom of an adjacent ship. Anticipating such results, I have already, by various publications, and officially in my late capacity as Chief Engineer of Woolwich Dockyard, directed attention to the principle of "Unsinkable Ships," as a means of obviating the fatal effects at sea of such devices, and I now beg reference to the following letter which appeared in *The Times*, of 12th January, 1859, explaining generally, though incompletely, the views which I entertain:—

To the Editor of the "Times."

Sir,—Many suggestions have of late been brought before the public on the construction of gunboats, mortar-boats, and floating-batteries, with a view to make them invulnerable; and I now beg to add my views on that subject. Why not make the floating body for such special services, up to the line of its load displacement, a solid mass of material of such specific gravity lighter than water that it shall not sink, however much it may be perforated by shot? It appears to me that a solid combination might be made of cork shavings, light wood sawdust, rush stems, cotton waste, flocks, hemp, and other light material, which, by the aid of a solution of gutta percha, or other chemical process, would form a solidifying mass, so tough that it could not be knocked to pieces by shot, and so light that it would be only one-half the specific gravity of water, and therefore unsinkable, however perforated by shot, and capable of carrying armament and naval equipment to the extent of nearly one-half the weight of its own displacement in tons. Such vessels of light draught accompanying fleets of war as tenders to line-of-battle-ships, whence they might be manned and stored as occasion might require, would, I submit, form a useful auxiliary available for shore service, or for attacking land batteries, which deep draught ships of the line cannot approach, and would be sunk if they could.

I may observe that this idea was first broached by me two years since as being applicable to the construction of vessels for carrying treasure. They might be wrecked ashore, but the reasure would be recoverable.

I am, Sir,
Your very obedient servant,
CHARLES ATHERTON,

Woolwich Dockyard, January 10th, 1859.

In respect to the practical carrying out of the general principle of "unsinkability," announced in the foregoing letter, I beg further to explain that I do not anticipate depriving war of the glory and honour which can only be purchased by blood. Without the sacrifice of blood in war the naval and military calling would be ignominious and the national spirit would become degenerate; no, let ordnance do its best. I would, however, seek in the construction of "unsinkable ships" that the life of a man may not be sacrificed by an ounce of lead, and that the whole crew of a ship may not be simultaneously drowned through the effective application of a single shot, or the descent of a single thunderbolt down through the deck and bottom of the ship, or by the lateral concussion of a hostile ram. With these views I always anticipated that the principle of "unsinkability" would, if adopted, be carried out, not exclusively by making the ship solid up to her load line, but on various plans of arranging and disposing of the buoyant material according to the special requirements of the service contemplated, for example, a treasure ship or ship built for being laden with specially valuable goods may, if so preferred, be a mass of buoyant material up to its load line. But a steam-ship may be constructed with its engine-room below the level of the load line, into this the water may possibly get access, but the ship when thus water-logged would be saved from going to the bottom by a sufficiency of buoyant material being constructively disposed of in various parts of the ship, such, for instance, as the hull and decks above the load water line being composed of as great a mass of material as is equivalent to the entire capacity of hold in space left vacant below the load water line.

Of course the efficacy of this system would be entirely dependent on the degree in which the specific gravity of the buoyant material may be less than the specific gravity of water. Various communications have already been made to me announcing the discovery of natural substances and artificial compounds not exceeding half the specific gravity of water, and apparently suitable for being used as a buoyant material in the construction of unsinkable ships on the principles thus set forth. The practical prosecution of the subject is so obvious, and the details of arrangements manifestly so adequate to the special objects for which a ship may be intended, that I need not, on the present occasion, encumber this promulgation of my views by entering into details. I would merely further observe that the mass of buoyant material may be so selected and disposed of that it may contribute greatly to the strength of the ship. Of course, in the practical adoption of this principle, as compared with the ordinary construction of ships, there must be a sacrifice of capability, but when it is considered that the great mass of buoyant material may be distributed below the water line, and thus conduce to the stability of the ship instead of being above the water line and thus impairing the stability of the ship, as is necessarily the case with the armour plating of invulnerable ships, and, moreover, when it is considered that the principle of unsinkability is applicable to vessels of small size, whilst invulnerability by iron armour plating can only be carried out with vessels of enormous magnitude, it may be confidently anticipated that the principle of unsinkability by the agency of buoyant materials, as distinguished from the principle of invulnerability by the agency of armour plating, is worthy of attention for mercantile purposes, especially in time of war, and as a supplementary adjunct for co-operating with ships of war in shoal waters where armoured ships, by reason of their necessarily great draft, cannot operate. In prosecuting the operations of war, ordinary ships, defended by unsinkable ships or otherwise kept out of harm's way, would be available as barracks, hospitals, and store ships for their accompanying fleet of unsinkable ships, of which the stowage for stores may be deficient.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE,

The following papers were read in the various sections:—

ON THURSDAY, OCTOBER, 2, 1862.

Section A.—Mathematical and Physical Science.

C. Tomlinson—On the Motion of Camphor, &c., towards the Light.

Isaac Ashe—Suggestions on Balloon Navigation.

J. P. Gassiot—Extract from an Account of a Visit to the Kew Observatory, presented to the Portuguese Government by Prof. J. A. de Souza, Professor in the University of Coimbra.

James Nasmyth—On some peculiar Features in the Structure of the Sun's Surface.

Rev. Prof. Challis—On the Extent of the Earth's Atmosphere.

Rev. Prof. Challis—On the Augmentation of the Apparent Diameter of a Body by its Atmospheric Refraction.

Wm. Spottiswoode—On the Hindu Method of Calculating Eclipses.

J. M. Menzies—Description of an Optical Instrument which Indicates the relative Change of Position of two Objects which are maintaining Independent Courses.

G. J. Symons—On British Rainfall during 1860 and 1861.

G. J. Symons—On the Performance, under trying circumstances, of a very small Aneroid Barometer.

Norman Pogson—Observations on three of the Minor Planets in 1860.

Dr. J. Croll—On the Mechanical Power of Electro-Magnetism, with special reference to Dr. Joule and Dr. Scoresby's Theory.

Section B.—Chemical Science.

An Address was delivered by the President.

T. Moffatt, M.D., F.G.S.—On the Luminosity of Phosphorus.

Thomas Sutton, B.A.—Description of a rapid Dry Collodion Process.

E. J. Lowe, F.R.A.S.—Remarks on Ozone.

J. H. Gladstone, Ph. D., F.R.S.—On the Essential Oil of Bay and other Aromatic Oils.

Dr. T. L. Phipson—On the existence of Aniline in certain Fungi, which become blue in contact with the Air.

Dr. T. L. Phipson—On the Artificial Formation of Populine, and on a new class of Organic Compounds.

Dr. T. L. Phipson—Analysis of the Diluvial Soil of Brabant, &c., known as the Liman de la Hesbaye.

Section C.—Geology.

The President—Opening Address.

H. Seely, F.G.S.—On a Whittled Bone, from the Barnwell gravel.

J. Crompton.—On a deep Well at Norwich.

Prof. Ansted, F.R.S.—On a Tertiary Bituminous Coal in Transylvania, with some notice on the Brown Coals of the Danube.

R. A. C. Godwin Austen, F.R.S.—On the Alluvial Deposits of the Rhine.

J. Gwyn Jeffreys, F.R.S.—On an ancient Sea Beach and Bed at Fort William.

Section D. — Zoology and Botany, including Physiology.

The President—Introductory Address.

John Gibbs—On the Inflorescence of Plants.

John Lubbock, F.R.S.—On two Aquatic Species of Hymenoptera, one of which swims with its wings.

J. Gwyn Jeffreys, F.R.S.—Exhibition of a specimen of *Astarte compressa*, having its hinge teeth reversed.

W. Lauder Lindsay, M.D., F.R.S., Edinburgh—On the Foot-poison of New Zealand.

The Rev. Wm. N. Molesworth, M.A.—On the Influence of the Conditions of Existence in modifying the characters of Species and Varieties.

Sub-section D.[1]—Physiology.

George Robinson, M.D.—On the Study of the Circulation of the Blood.

Charles Kidd, M.D.—On Simple Syncope as a coincidence in chloroform accidents.

George D. Gibb, M.D.—On the Physiological Effects of the Bromide of Ammonium.

John Davy, M.D., F.R.S.—Observations on the Earth Worm.

Section E.—Geography and Ethnology.

Capt. Richard Burton, H.M., Consul at Fernando Po.—Ascent of the Cameroons Mountains, West Africa.

J. Crawfurd, Esq., F.R.S.—On Colour as a Test of the Races of Man.

Dr. Livingstone, communicated by the Rev. William Monk—Letter from Eastern Africa.

Rev. H. C. Scudamore, communicated by the same—On the Proceedings of the United University Mission.

Rev. Mr. Stewart — Voyage on the Lake Nyassa, Eastern Africa.

Major Walker—On the Trans-Indus Frontier of British India.

Section F.—Economic Science and Statistics.

President's Address.

Rev. Vernon Harcourt, M.A.—Report of the Committee on Technical and Scientific Evidence in Courts of Law.

Charles M. Willich—On Expectation of Life.

Rev. George Fisher, M.A., F.R.S.—On the Numerical Mode of Estimating Educational Qualifications, as pursued at the Greenwich Hospital School.

Section G.—Mechanical Science.

President's Address.

James Nasmyth—On an Improved form of "Link" Motion.

Edward E. Allen—On the Importance of Economising Fuel in Iron-plated Ships.

Dr. Filippo Grimaldi—A New Marine Boiler.

Wm. Thorold—On the Failure of the Sluice in the Fens, and on the Means of securing such Sluices against a similar contingency.

J. Coryton—A vertical Wave-line systemof Ship construction.

J. Coryton—Oblique system Self-reefing Sails.

J. Croyton—Atmospheric Guide Propeller.

In the evening Prof. Tyndall delivered, in the Guildhall, his discourse "On the Forms and Action of Water."

FRIDAY, OCTOBER, 3, 1862.

Section A.—Mathematical and Physical Science.

Fleeming Jenkin — Provisional Report on a proposed standard of Electrical Resistance.

Fleeming Jenkin — Provisional Report on Thermo-Electric Currents in circuits of one metal.

Arthur Cayley — Report on certain Dynamical Problems.

Arthur Cayley—On a certain Curve of the fourth Order.

Arthur Cayley—On the Representation of a Curve in Space, by means of a Cone and Monoid Surface.

Rev. R. Harley — On a certain class of Linear Differential Equations.

W. H. L. Russell—Some Account of recent Discoveries made in the Calculus of Symbols.

T. L. Plant—On Meteorology, with a Description of new Meteorological Instruments.

Rev. Dr. Booth—On an Instrument for describing Geometrical Curves, invented by Henry Johnson.

G. R. Birt—On three new Craters in the Moon not in Beer and Mädler's Map.

Rev. R. Main — Observed R.A. and N.P.D. of Comet II., 1862.

Rev. R. Main—On the Dimensions and Ellipticity of Mars.

Rev. Prof. Challis—On the Zodiacal Light, and Shooting Stars.

Rev. Prof. Selwyn—On Autographs of the Sun.

Section B.—Chemical Science.

G. B. Buckton, F.R.S.—Notes on the Decomposition of the Organo-Metallic Radicles.

J. P. Gassiot, F.R.S.—On the Mode of Preparing Carbonic Acid Vacua.

William Odling, M.B., F.R.S.—On the Synthesis of some Hydro-Carbons.

Monsieur A. Des Cloizeaux—Modification temporaire et permanente apportée par la chaleur à certaines propriétés optiques du feldspath orthose, de la cymophane et de la Brookite.

W. H. Harris—On the Adulteration of Linseed Cake with Nut Cake.

Section C.—Geology.

W. Boyd-Dawkins—On the Wokey Hole Hyæna-den.

Dr. Daubeny, F.R.S.—On the last Eruption of Vesuvius.

W. T. Blanford, F.G.S—On an Extinct Volcano in Upper Burma.

H. C. Sorby, F.R.S.—On the comparative Structure of Artificial and Natural Igneous Rocks.

Prof. Harkness, F.R.S.—On the Skiddaw Slate Series.

Charles Moore, F.G.S.—Contributions to Australian Mesozoic Geology.

Wm. Pengelly, F.G.S.—On the Co-relation of the Slates and Limestones of Devon and Cornwall with the Old Red Sandstone of Scotland.

Section D. — Zoology and Botany, including Physiology.

James Buckman—Experiments with the Seed of mal formed Roots, and on the enobling of Roots, with particular reference to the Parsnip.

James Samuelson — Recent Experiments on Heterogenesis, or Spontaneous Generation.

Richard Owen, D.C.L., F.R.S.—On the zoological significance of the Brain and Limb characters of Man: with remarks on the Cast of the Brain of the Gorilla.

Richard Owen, D.C.L. F.R.S.—On the homologies of the bones of the head of the *Polypterus niloticus*.

Richard Owen, D.C.L., F.R.S.—On the characters of the Aye-aye, as a test of the Lamarckian and Darwinian, hypothesis of the Transmutation and origin of Species.

A. D. Barlett—Observations of the habits of the Aye-aye living in the Gardens of the Zoological Society Regent's Park, London.

Dr. Cleland—On Ribs and Transverse Processes, with Special Relation to the Theory of the Vertebrate Skeleton.

Professor Allman—On the Structure of Corymorpha.

Subjection D[1]—Physiology.

T. Spencer Cobbold, M.D., F.L.S.—On all the Known Forms of Human Entozoa.

Edward Smith, M.D., F.R.S.—Tobacco smoking: its Effect upon the Pulsation.

John Davy, M.D., F.R.S.—On the Question whether Arsenic taken for lengthened periods in very minute quantities is injurious.

Professor Harley, M.D.—On Secret Poisoning.

Professor Rolleston, M.D., F.R.S.—On the Difference of behaviour exhibited by Inuline and ordinary Starch when treated with Salivary Diastase and other converting agents.

J. W. Osborne—Observations made at Sea on the Motions of Vessels, with Reference to their Effects in producing Sea Sickness.

Section E.—Geography and Ethnology.

Professor Ansted, F.R.S.—On the climate of Guernsey.

Commander Mayne—On Vancouver's Island.

John Bailey, Esq.—An account of the Veddahs of Ceylon.

Dr. Beke—A Journey to Harran in Padan Aram, and thence over Mount Gilead into the Promised Land.

Rev. G. Prout—Ascent of Um Shaumur, in the Peninsula of Sinai.

John Rochfort.—The Middle Islands of New Zealand.

Section F—Economic Science and Statistics.

Henry Fawcett, M.A.—On the Economic Effects of recent Gold Discoveries.

Frederick Purdy—On Local Taxation and Real Property.

W. T. Thornton—On the Income Tax.

Richard Valpy—The Tariffs and Trades of various Countries during the last Ten Years.

Dr. Watts—On the Practicability of a Division of the Employer's Profits amongst the Work-people.

Section G—Mechanical Science.

James Oldham—Report on Tidal Observations in the Humber.

R. W. Woollcombe—On Oblate Projectiles with Cycloidal Rotation, contrasted with Cylindro-Ogival Projectiles having Helical or Rifle Rotation.

Professor D. T. Ansted, M.A., F.R.S.—On Artificial Stones.

G. B. Airy, M.A., F.R.S., Astronomer Royal—On the strains in the Interior of Beams and Tubular Bridges.

P. Le Neve Foster, M.A.—On Machinery for Composing and Distributing Type. A communication from Charles Hart.

Captain J. Stewart, R.N.—On a proposed New Arrangement of Ships' Rudders.

In the evening a Conversazione with experiments was held at the Guildhall.

SATURDAY, OCTOBER 4, 1862.

Section A—Mathematical and Physical Science.

Rev. Dr. Lloyd.—Report of a Committee to Inquire into the adequacy of existing Data for carrying into Effect the Suggestion of Gauss to apply his general Theory of Magnetism to Magnetic Variations.

F. J. Evans—Report on the Three Reports of the Liverpool Compass Committee.

Professor Stokes—Report on Double Refraction.

M. A. Des Cloizeaux—Relation entre les phénoménes de la polarization rotatoire et les formes hemiedres ou hemimorphes des cristaux à un ou à deux axes optiques.

Professor Hennessy—On some of the Characteristic Differences between the Configuration of the Surfaces of the Earth and Moon.

E. Esselbach—On an Experimental Determination of the Absolute quantity of Electric charge.

Isaac Ashe, A.B., M.B., T.C.D.—On some Improvements in the Barometer.

John Ball—On the Determination of Heights by means of the Barometer.

T. A. Hirst—On the Volumes of Pedal Services.

William Ogilby—On the Excentricity of the Earth and the Method of finding the Co-ordinates of its centre of Gravity.

Section B—Chemical Science.

J. W. Osborne—On a Photolithographic Process adopted by the Government of Victoria for the publication of Maps.

G. C. Foster, F.C.S.—On the Principles upon which Atomic Weights should be determined.

W. Odling, M.B., F.R.S.—On the Nomenclature of Organic Compounds.

G. Harley, M.D.—On Schöbein's Antozone.

D. Campbell, F.C.S.—On the Action of Nitric Acid upon Pyrophosphate of Magnesia.

Section C—Geology.

Dr. L. W. Lindsay—On the Gold-fields of Auckland, New Zealand.

Dr. L. W. Lindsay—On the Gold-fields of Otago, New Zealand.

Professor Owen, F.R.S.—Exhibited and described the Tooth of a *Mastodon*, from Tertiary Marls, near Shanghai, China.

H. C. Sorby, F.R.S.—On the Cause of the Difference in the state of preservation of different kinds of Fossil Shells.

J. W. Salter, F.G.S.—On the Identity of the Upper Old Red Sandstone with the Uppermost Devonian (the Marwood beds of Murchison and Sedgwick), and of the Middle and Lower Old Red with the Middle and Lower Devonian.

S. P. Saville—Exhibited a Skull of the *Rhinoceros tichorhinus*.

Section D—Zoology and Botany including Physiology.

Section D did not meet on Saturday, on account of the Excursion to Hunstanton.

Sub-Section D[1].—Physiology.

Isaac Ashe, A.B., M.B., T.C.D.—On the Function of the Auricular Appendix of the Heart.

Isaac Ashe, A.B., M.B., T.C.D.—On the Functions of the Oblique Muscles of the Orbit.

G. D. Gibb, M.D.—On the Normal Position of the Epiglottis as determined by the Laryngoscope.

James Dowie—Remarks on the Loss of Muscular Power, arising from the ordinary Foot-clothing now worn, and on the means required to obviate this loss.

Professor Beale, M.B., F.R.S.—An attempt to show that every living structure consists of matter which is the seat of Vital Actions, and matter in which Physical and Chemical changes alone take place.

Henry Freke, A.B., M.B., T.C.D.—A Tabular View of the Relation which subsists between the Three Kingdoms of Nature with regard to Organization.

R. Garner, F.L.S.—On an Albino variety of Crab, with some observations on Crustaceans, and on the effect of Light.

Professor W. Köhne—On the Termination of Motor Nerves, and their connexion with Muscular Contractions.

Section E—Geography and Ethnology.

Sir Rutherford Alcock, K.C.B.—On the Civilization of Japan.

William Mathews, M.A.—On serious Inaccuracies in the Great Survey of the Alps, south of Mont Blanc, as issued by the Government of Sardinia.

Lieutenant-Colonel Sarel—On the Yang-tze-Kiang River, Canton.

Alfred R. Wallace—On the Eastern Archipelago and New Guinea.

Section F—Economic Science and Statistics.

Frederick Purdy—On the Pauperism and Mortality of Lancashire, &c.

J. C. Buckmaster—On the Progress of Instruction in Elementary Science among the Industrial Classes under the Science Minutes of the Department of Science and Art.

James Heywood, F.R.S.—On Endowed Education and Oxford and Cambridge Fellowships.

Section G—Mechanical Science.

Section G did not meet on Saturday, in order to enable the members attending this Section to visit the Middle Leval Dam and Siphons at Watlington.

MONDAY, OCTOBER 6, 1862.

Section A.—Mathematical and Physical Science.

J. Glaisher—Report on Luminous Meteors.

J. Glaisher—On a new Barometer used in the last Balloon Ascent.

Prof. Hennessy—Report on Vertical Movement of the Atmosphere.

Prof. Sylvester—On the general Solution of the Linear Equation in Finite Differences.

Prof. G. Boole—On the Differential Equations of Dynamics.

R. Mallet—On the Measurement of Temperature of Active Volcanic Foci to considerable Depths, and of the Temperature and issuing Velocity of the Steam and Vapour evolved.

Prof. Hennessy—On the Relative Amount of Sunshine falling on the Torrid Zone of the Earth.

Prof. W. J. M. Rankine—On the Form and Motion of Waves at and near the Surface of Deep Water.

J. Park Harrison—On the additional Evidence of the Indirect Influence of the Moon over the Temperature of the Air, resulting from the Tabulation of Observations taken at Greenwich in 1861-2.

Dr. Gladstone—On the Distribution of Fog round the Coasts of the British Isles.

E. J. Lowe—On the Hurricane, near Newark, of May 7, 1862, showing the Force of the Hailstones and the Violence of the Gale.

F. Galton—European Weather Charts for Dec., 1862.

F. Galton—The "Boussole Burnier." A new French pocket instrument for measuring vertical and horizontal angles.

S. A. Rowell—On Objections to the Cyclone Theory of Storms.

Rev. Thos. Rankine—Meteorological Observations.

A. Claudet—On the Means of following the small Divisions of the Scale regulating the Distances and Enlargement of the Solar Camera.

Section B.—Chemical Science.

Dr. B. H. Paul—On the Manufacture of Hydro-carbon Oils, Paraffin, &c., for Peat.

A. Vernon Harcourt, M.A., F.C.S.—On a Particular Case of induced Chemical Action.

T. Sterry Hunt, M.A., F.R.S.—On some Principles to be considered in Mineralogical Classification.

Prof. H. E. Roscoe—On Hypobromous Acid.

J. W. Osborne, Esq.—On the Essential Oils and Resins from the indigenous Vegetation of Victoria.

Section C.—Geology.

Prof. Phillips, F.R.S.—Supplementary Report on Slaty Cleavage: Theoretical Considerations.

Dr. T Sterry Hunt, F.R.S.—Preliminary Report of the Committee for Investigating the Chemical and Mineralogical Composition of the Granite of Donegal, and the Associated Rocks.

Dr. Falconer, F.R.S.—On Ossiferous Caves in Malta, explored by Captain Spratt, R.N., C.B., with an Account of Elephas Melitensis, a pigmy Species of Fossil Elephant, and other remains found in them.

Captain Godwin-Austen, H.M. 24th Regt.—On the Glacier-Phenomena of the Valley of the Upper Indus.

Dr. K. von Seebach—On the Diluvial and Alluvial Deposits of Central Germany, and on the Climate of the Period.

C. W. Peach—On the Fossils of the Boulder-clay in Caithness.

C. B. Rose, F.G.S.—Noticed some Mammalian Remains from the Bed of the German Ocean.

Rev. J. Dingle—On Specimens of Flint Implements from North Devon.

Dr. Daubeny, F.R.S.—Exhibited Flint Implements from Abbeville and Amiens.

The Rev. T. G. Bonney, M.A.—Exhibithed some Flint Implements from Amiens.

—— Doughty—Exhibited Flint Implements from Hoxne.

Dr. Fritsch—Exhibited some Models of Foraminifera.

Section D.—Zoology and Botany, including Physiology.

Dr. Gray—On the Crocodiles of India and Africa, and on the change of form of the Head of Crocodiles.

Dr. Collingwood, F.L.S.—Report on the Mercantile Marine.

Dr. Collingwood, F.L.S.—On Geoffroy St. Hilaire's distinction between Catarrhine and Platyrrhine Quadrumana.

James Hinton—A Suggestion for the Physiological Classification of Animals.

Prof. Allman—On a new Form of Echinodermata.

Sir John Richardson—On Zoological Provinces.

Gilbert Child, M.D.—On Marriages of Consanguinity.

Rev. Thomas Hincks—On the Production of similar Medusoids by certain Hydroid Polypes belonging to different Genera.

Prof. Allman—On the generative Zooid of Clavatella.

Prof. Allman—On some new British Tubularidæ.

Prof. Allman—Report on the Reproduction of the Hydroida.

Sub-section D.[1]—Physiology.

John Davey, M.D., F.R.S.—Some Observations on the Vitality of Fishes as tested by increase of Temperature.

John Davies, M.D., F.R.S.—Some Observations on the Coagulation of the blood in relation to its Cause.

R. Garner, F.L.S.—Pearls—their parasitic origin.

Thomas Reynolds—Tobacco, in relation to Physiology.

R. Garner, F.L.S.—The Skull Sutures, and their relation to the Brain.

Section E.—Geography and Ethnology.

The Chevalier Ignazio Villa—Terrestrial Planispheres.

The Rev. Dr. Mill—Decipherment of the Phœnician Inscription on the Newton Stone, Aberdeenshire. Communicated by the Rev. G. Williams.

Dr. Livingstone—Recent Letter to Sir Roderick I. Murchison.

John Crawfurd—On Language as a Test of the Races of Man.

T. Wright—Report on the Human Remains found in the course of the Excavation at Wroxeter.

Michelsen—Geography of Bread Plants.

Section F.—Economic Science and Statistics.

Henry Dunning Macleod, B.A.—On the Definition and Nature of the Science of Political Economy.

Herman Merivale—On the Utility of Colonisation.

Dr. Smith—A Statistical Inquiry into the Prevalence of numerous Conditions affecting the Constitution of 1,000 Consumptive Persons when in Health.

Section G.—Mechanical Science.

Wm. Smith, C.E.—Report of Steam-ship Committee.

Charles Atherton—On Unsinkable Ships.

W. Fairbairn, F.R.S., President of the Section—On the Results of some Experiments on the Mechanical Properties of Projectiles.

Theo. Aston—on Projectiles, with regard to their Power of Penetration.

R. W. Woolcombe—On Excentric Projectiles.

W. Thorold—continuation of his paper—On the Failure of the Sluice in the Fens, and on the Means of securing such Sluices against a similar contingency.

Dr. Odling delivered a discourse in the Guildhall, "On Organic Chemistry."

TUESDAY, OCTOBER 7, 1862.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

Col. Sykes.—Report of the proceedings of the Balloon Committee.

J. Glaisher.—Results and discussions of the Observations made in eight Balloon Ascents.

Dr. E. Esselbach.—On the duration of Fluorescence.

Dr. E. Esselbach.—On Electric Cables, with reference to Observations on the Malta-Alexandria Telegraph.

W. Esson.—On the Curvature of the Margins of Leaves, with reference to their growth.

Prof. J. Thomson.—On Disintegration of Stones exposed in buildings, and otherwise, to Atmospheric influences.

J. Ball.—Report on Thermometric Observations in the Alps.

Dr. Lee.—On a brilliant Elliptic Ring in the planetary nebulæ R.A. 20h. 56m., N.P.D. 101°. 56′, communicated by Mr. Lassell.

Isaac Ashe, A.B , M.B. T.C.D.—Some Cosmogonical speculations.

G. Miller Guy.—Account of an Electro-motive Engine

Rev. J. B. Reade.—Experiments on Photography with Colour.

Chev. Ignazio Villa.—On some improved celestial Planispheres.

C. M. Willich.—On some models of sections of the Cube.

SECTION B.—CHEMICAL SCIENCE.

J. B. Laws, F.R.S., F.C.S., and J. H. Gilbert, F.R.S., F.C.S.—On the Effects of different Manures on the mixed Herbage of Grass Land.

I. Maxwell Lyte, M.A., F.C.S.—On some of the Difficulties arising in the Practice of Photography, and the Means of removing them.

Charles Heisch, F.C.S.—On a simple Method of taking Stereomicrophotographs

William Odling, M.B., F.R.S.—On Ferrous Acid.

J. H. Gladstone, Ph.D., F.R.S.—On the means of observing the Lines of the Solar Spectrum due to the terrestrial atmosphere.

Dr. B. H. Paul—On the Decay and Fermentation of Stone employed in building.

Prof. N. S. Maskelyne—On Aerolites from India.

Prof. N. S. Maskelyne—On Columbite from Monte Video.

SECTION C.—GEOLOGY.

Professor Ansted, F.R.S.—On Bituminous Schists and their relation to Coal.

Chas. Moore, F.G.S.—On the Palæontology of Mineral Veins, and the Oolitic age of some of the Mineral Veins in the Carboniferous Limestone.

Professor Owen, F.R.S.—On the Fossil-Feathered Animal (*Griphosaurus* of Wagner, *Palæopteryx* of Von Meyer) found in the lithographic slate of Pappenheim.

Dr. Allman, F.R.S.—On a new form of Recent Echinoderm, and its probable palæontological affinities.

Dr. T. Sterry Hunt, F.R.S.—On the Origin and Mode of Occurrence of the Petroleum of North America.

Dr. T. Sterry Hunt.—On the Structure and Origin of certain Limestones and Dolomites.

T. A. Readwin, F.G.S.—On the Gold-bearing strata of Merionethshire.

A. B. Wynne, F.G.S.—On the Geology of a part of Sligo.

F. J. Foot, M.A.—To exhibit and describe some of the six-inch Geological Maps of the Burren district, county Clare, Ireland.

Dr. Alexander Carte and W. N. Baily, F.G.S.—On a *Plesiosaurus* from the Lias of Whitby.

Gilbert N. Smith.—Report of a successful search for Flint Implements in a cave called "the Oyle," near Tenby, South Wales.

Rev. W. S. Symonds, F.G.S.—To exhibit some Scutes of the *Labyrinthodon* from the Keuper bone-breccia of Pendock, Worcestershire.

C. W. Peach—On New Fossil Fishes from the Old Red Sandstone of Caithness.

SECTION D.—ZOOLOGY AND BOTANY, INCLUDING PHYSIOLOGY.

No meeting.

SUB-SECTION D¹.—PHYSIOLOGY.

No meeting.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Pierotti—Recent notices of the Rechabites. Communicated by the Rev. G. Williams.

Sir Charles Nicholson—Late Explorations in Australia, by Burke and Wills, Gregory, &c.

Robt. Dunn—Some Observations on the Psychological Differences that exist among the Typical Races of Man.

Jules Gérard—Exploration dans l'Afrique centrale, de Sierre Leone, á Algers, par Timbuctu.

Henri Mouhot—Cambodia and the Laos States.

R. S. Poule—On the Ethnology of Egypt.

Rev. T. G. Bonney—Geography of Mont Pelvoux, in Dauphiné.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

The President.—On the Subject matters and Methods of Competitive Examinations for the Public Service.

Rev. Wm. Emery, B.D.—On the Expenses and Social Condition of University Education.

Henry Roberts, F.S.A.—Statistics which shew the increasing circulation of a Pure and Instructive Literature, adapted to the Capacities and the Means of the Labouring Population.

Rev. W. N. Molesworth, M.A.—On the Instruction and Training of the unemployed in the Manufacturing Districts during the present Crisis.

W. Stanley Jevons, M.A.—Notice of a General Mathematical Theory of Political Economy.

W. Stanley Jevons, M.A.—On the Study of Periodic Commercial Fluctuations.

Edwin Hill.—On the Prevention of Crime.

SECTION G.—MECHANICAL SCIENCE.

Wm. Smith, C. E.—Report of the Committee on Railway Accidents.

L. Williamson—The relative merits of Iron as compared with Wooden Ships, as regards Repair and Security of Life.

Professor J. M. Rankine—On the Form and Motion of Waves at and near the Surface of Deep Waters.

C. Vignoles—On the Practice and Principles of Diverting Rivers and Stoppage of the Breaches in Embankments.

J. Sewell, Assoc. I.C.E.—On the Prevention of Railway Accidents.

T. Sortais—On an Improved Printing Telegraph Apparatus.

J. W. Osborne—Instruments for Observing the Motion of Vessels at Sea with reference to Sea sickness.

A. C. Tylor—On the Manufacture of Armour Plates.

A *converzazione* took place in the Guildhall, at which M. Claudet exhibited, by the solar microscope, illuminated by means of the oxyhydrogen lime light, enlarged pictures of small photographs.

WEDNESDAY, OCTOBER 8, 1862.

Section A.—Mathematical and Physical Science.

Latimer Clark.—On Electrical Tensions.

J. Croll.—On the Cohesion of Gases, and its relations to Carnot's function, and to recent experiments on the Thermal effects of Elastic Fluids in motion.

E. Vivian.—On the Trajectory Target for Long-range Rifle practice.

E. Vivian.—On the Results from Self-registering Hygrometers.

Rev. F. Bashforth.—On Capillary attraction—comparison of Theory and Experiment.

Sir W. R. Hamilton.—Quarternion proof of a Theorem of Reciprocity of Curves in Space.

Dr Hurlburt.—On the Storms of the St. Lawrence and Great Lakes of Canada.

Dr. Hurlburt—Some Facts relating to two brilliant Auroras in Canada.

J. Schwarcz—On the probable Origin of the Heliocentric Theory.

J. Smith—Remarks on the Complementary Spectrum.

J. Dingle — On the Supernumerary Bows in the Rainbow.

Section F.—Economic Science and Statistics.

David Chadwick—The Cotton Famine and Substitutes for Cotton.

Henry Harben—Some Statistics of Zostera Marina as a Substitute for Cotton.

Proceedings of Institutions.

Birmingham and Midland Institute.—On Wednesday evening, the 29th of September, the academical session of this Institute was inaugurated by an address from the Right Hon. Sir John Pakington, Bart., the President. The address was delivered in the theatre of the Institute, which was well filled. He observed that there had been only one previous occasion on which he had attended a public meeting in connection with this Institute, and that was in 1855, when the late Prince Consort came to lay the foundation stone of the building, and when, in the course of a wide and admirable address, he laid down the principle of "the introduction of science and art as the unconscious regulators of productive industry." A year has not yet elapsed since every British home was involved in sadness and gloom by the sudden tidings that, in the prime of his days, in the vigour of his great intellect, in the midst of his useful career, the Prince was dead, and it was impossible for us not to feel that we have lost the wise and thoughtful adviser of our beloved Sovereign—the patron of art, the friend of education, and the promoter of every social improvement which could increase the comfort or elevate the character of the people. Seven years had passed away since that auspicious inauguration, and perhaps it might be well to inquire what had been done by this Institution during those seven years. On the occasion to which he (Sir J. Pakington) referred, the Prince in his address had alluded to those branches of knowledge which had long been selected as the essential elements in the teaching of our great academies and seats of instruction. He referred to those sciences, such as politics, jurisprudence, political economy, and others, and, finally, he gave emphatic advice as to the line of study which he would recommend them to pursue, as relating most closely to the special objects of this Institution, viz., the sciences of machanics, physics, and chemistry, and the fine arts in painting, sculpture, and architecture. It was clear from these annual reports that this advice had not been neglected. It was impossible to consider without deep interest the range of study which had been established and carefully carried out from the commencement of this institution—a range of study by which the middle classes and skilled artisans of this great city had the means of moral and intellectual improvement placed within their reach. When he saw that certificates had been granted to very many candidates for competent knowledge of one or more of the sciences, for English history and literature, the French and German languages, English grammar and composition, and mathematics, he could not refrain from comparing such a course of study with the teaching given by our great public schools to the sons of the highest and wealthiest citizens of the State. He was not disposed to question the advantages of classical acquirements, but he must, at the same time, confess that the almost exclusive teaching of the dead languages which had long been the system of our Universities and great public schools, appeared to him to be a serious error. It was, doubtless, true that school teaching might be regarded as only laying the foundation for subsequent self-culture. But this foundation should, in his opinion, be as broad as possible? No study in after life could compensate for neglect in youth, and it was a grievous waste of those precious years when learning is the first business of life, and when there is in the human mind a power of acquiring and retaining knowledge which never recurs, that a large portion of the youth of England should be taught, between the ages of seven and twenty-one, little besides Greek and Latin. The teaching of all classes should be adapted to the circumstances of the age. None can afford to disregard the rapid progress which is the characteristic of the present century. After enlarging upon this subject at some length, the President said he understood that an application had been made to the Council to include Latin amongst those taught in the Institute, and he hoped this would be favourably received. He then alluded to some other subjects, the omission of which he regretted. Amongst them was physiology. Year after year the reports of this Commission repeated that their sanitary efforts were obstructed and often rendered nugatory, by the prevalent ignorance among all classes of the natural conditions of health—an ignorance which prevented the advantages of sanitary measures from being either understood or appreciated. The Government was, therefore, advised to introduce physiology into the common schools of the country, and he thought the importance of the subject in relation to health could hardly be overrated. Another subject which he would urge them to include in their course of instruction was geology, the bearing of which upon many of their manufactures was evident. The trade of Birmingham consisted mainly of the manufacture of brass, electroplate, guns and gun barrels, metal pens, jewellery, and glass. Were not the materials which are required for each and all of these manufactories exactly those with which the study of geology would tend to make them better acquainted? Even glass was no exception. The sands, the alkaline salt, lead, and other materials which enter into the composition of glass were all within the scope of geology, as were the various mineral substances required for the other trades he had mentioned. Another omission of the programme was the absence of any class for drawing. He had been informed that the absence of any drawing class was caused by the fact that the Birmingham School of Design is accommodated within their building. This was certainly an explanation; but still, as theirs was an admirable, a model institution, and the study of drawing was undoubtedly one which ought to occupy a foremost place, he would rather see it included in the duties of their own teachers than left to the care of another body with which they had no real connexion, and over which they had no control. Artistic skill in drawing, and taste and fertility of design, were quite essential to most of their manufactures. Practical mechanics was another subject which might, he ventured to

think, be advantageously inserted in their list of classes, as bearing directly upon some of those occupations to which the lives of some of their students must be devoted. But he would no longer dwell upon these supposed defects, but would turn with far greater pleasure to the remarks which he wished to make upon their system of study, and upon the degree of success which had attended it. That success had been such that the language of truth must be language of congratulation. Their teaching power was evidently, at present, adequate and good. And it was likely to remain so, owing in a great degree to the wise decision at which they arrived two years ago, not to accept gratuitous teaching, however competent the teacher, or however generous his intentions, but to pay for such services in every case. Not only had the number of certificates granted by the Council of the Institute increased very considerably from year to year, but the candidates had been tried by other severe tests. A most valuable stimulus had of late been given to secondary education, and a most useful encouragement to competent teaching by the establishment of the examinations by the Society of Arts, and the Science and Art Department of the Government in different parts of the country. They had had for three years the benefit of the former, but to the latter they last year submitted for the first time. The result had been most creditable. In the first year of the Society of Arts' Examination 13 candidates —examined in either chemistry, algebra, French, English history, or geometry—obtained two first-class certificates, and 11 others. In the second year, 17 candidates obtained five first-class and 12 others. Last year the competition was divided between the Society of Arts and the Science and Art Department, and of 19 candidates examined by the latter in chemistry, or experimental physics, two obtained a first-class Queen's prize and medal; three, second-class Queen's prize; five, third-class Queen's prize, and the rest "passed." That every one of the candidates who submitted, on this first occasion, the examination by the Science and Art department should have been able to pass, was a most gratifying fact; but other proofs were not wanting, both of the successful teaching they had given and of the good effects which, in various ways, result from the existence of such an institution. He had seen a list of not a few names of young men who received their scientific training in that institute, and who were now filling with honour to themselves situations in which scientific knowledge is required. The President strongly urged upon all classes to avail themselves of the advantages of this Institution. It welcomed and taught the artisan, but it aimed at higher educational purposes, and it offered education such as, in his opinion, the middle, and, indeed, the upper classes of that great city, might with advantage to themselves accept. He hoped the day was not distant when they might see different classes mingling to a considerable extent, not only in the primary school, but in the secondary college, and this admirable institute seemed to invite the introduction of such a system. He made some reference to the advantages offered by the Free Library which was located near the Institute to which it would be a valuable adjacent. Sir John Pakington concluded as follows:— "A few years ago the skilled artisan was a man who, by personal aptitude, had attained a certain degree of manual dexterity or inventive power; now the skilled artisan is a man of scientific education and cultivated intellect, fitted to take his place among the most intelligent of his fellow-citizens, and to rise, according to the measure of his capacity, to honours of the State. It is impossible not to feel that such changes have great political importance. The system of government under which we live involves us all in serious responsibilities, and the more enlightened are the people the greater is our security for those responsibilities being faithfully fulfilled. The man who has studied the history of this country is the least likely to undervalue our institutions. This is not the moment for me to dwell upon the warning which we may derive from the events which are now passing in America; but I may, in perfect consistency with my present duty, express my belief that our suffering countrymen in Lancashire would not have borne their sad privations with the fortitude which has done them so much honour, had it not been for the effect which the increase of education and refinement had produced upon the habits and feelings of the people. I may also congratulate you who are engaged in the trade of Birmingham that you have found in the extension of your commerce with France some compensation for the decrease of your American trade, and I trust you may never be exposed to any trial so painful and severe as that which has now fallen —but God grant it may be only for a brief period!—upon the operatives of Lancashire. There is only one topic more on which I am desirous to touch. When your late respected president (Mr. Ryland) did me the honour last winter of inviting me to become his successor, I wrote to him for information upon certain points connected with the Institute, and his answer concluded with the following words:—'It is a great success, and in working to bring about that success all parties in politics and religion have heartily co-operated.' This fact is honourable to your citizens. Under the English system of government party action is a necessity, and men are prone to be warm in support of that which they sincerely believe to be right and essential to the welfare of their country; but party has no business here. Here men of all parties may meet on common ground, and, working together for an object of common interest, may learn to respect each other's motives, and to believe in the honesty and sincerity of each other's intentions. I trust you will long continue to act in this spirit. You have founded a noble institution. You have, as the Prince Consort predicted, "Conferred an inestimable boon upon your country;" and I trust you may receive your best reward in seeing its continued prosperity and its increasing good effect upon the knowledge, the intelligence, and the character of your fellow-citizens." At the conclusion of his address a vote of thanks to Sir J. Pakington was moved by the Mayor, and carried by acclamation.

Polytechnic Institute, London.—The distribution of certificates took place on Monday evening, the 6th inst., in the presence of about 700 persons, assembled to witness the entertainments of the Polytechnic Institution. The Rev. Charles Mackenzie (Hon. Director of the Educational Department) distributed to the successful students the certificates which they had obtained at the late Examinations conducted by the Society of Arts. The chairman explained the distinction between the Educational and other portions of the Polytechnic Institution, &c., and the particular operations of the Examination from which those certificates were obtained. He also showed that these classes differed from those which he had established in the City of London in two important particulars—they were for ladies as well as for gentlemen, and were open in the morning as well as the evening. After paying a tribute to the masters, and congratulating the students upon their success, he asked the company assembled for their sympathy in a cause which was calculated to meet the wants of the day, and to improve the social and moral conditions of the growth of the nation.

MEETING FOR THE ENSUING WEEK.

Monday—Medical Society, 8½. Dr. J. Cockle, "On Aneurismal Tumours, involving the Neck."

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, September 26th*, 1862.]

Dated 16th September, 1862.

2538. **B. F. Weatherdon, Kingston-upon-Thames, and E. H. C. Monckton, Fineshade Abbey, Northamptonshire—A new or improved engine for obtaining and applying motive power.**

2544. R. Lakin, Ardwick, Lancashire—Imp. in the mode of plating or shielding ships of war.
2546. C. E. Guye, Fleurin, Switzerland—Imp. in apparatus for cutting and finishing the teeth of wheels. (A com.)

[*From Gazette, October 3rd*, 1862.]

Dated 22nd May, 1862.

1548. P. R. Hodge, Tokenhouse-yard—An improved dinner, supper, breakfast, or dessert plate.

Dated 31st May, 1862.

1648. T. T. Lawden, Birmingham—Imp. in certain descriptions of single and double barrelled guns.

Dated 19th June, 1862.

1806. H. Rushton, 48A, Northampton-road, Clerkenwell—Imp. in plaiting machines to plait cotton yarns, silk, or like fibrous materials.

Dated 28th July, 1862.

2133. T. A. Favrichon, St. Symphorien de Lay, France—An apparatus for the speedy and economical heating of baking ovens, and also for using their excess of heat.

Dated 15th August, 1862.

2299. J. Barclay, Gravel-lane, Southwark—Improved machinery for the manufacture of nails.

Dated 21st August, 1862.

2336. M. Wilkinson, Blackburn—Imp. in carding engines, parts of which imps. are applicable to drawing and such like frames.

Dated 26th August, 1862.

2365. G. Davies, 1, Serle-street, Lincoln's-inn—Improved machines for washing skeins of cotton, linen, wool, or silk. (A com.)

Dated 1st September, 1862.

2420. W. C. Edge, Clerkenwell—Imp. in the manufacture of Albert chains, and in the mode of securing the same to the vest of wearer.

Dated 4th September, 1862.

2446. W. Clark, 53, Chancery-lane—Imp. in the manufacture of a blue colouring matter. (A com.)

Dated 11th September, 1862.

2495. W. A. Munn, Throwley-house, Faversham—An improved apparatus for capping, loading, and closing cartridges for breech-loading fire-arms.
2497. G. Weeks, Bromley, Kent—Imp. in constructing frames, trays, pots or holders for flowers, plants, or shrubs, growing or otherwise, with arrangements for their display, and also for drainage.
2499. F. Datichy, Mortimer-street, Middlesex — Imp. in steam engines.
2501. R. A. Brooman, 166, Fleet-street—Imp. in implements for cultivating the soil. (A com.)
2505. A. Barclay, Kilmarnock, Ayr, N.B.—Imp. in locomotive boring and winding engines.
2507. J. Walker and F. Walker, Leeds—Imp. in machinery for combing and carding or hackling flax, silk, wool, and other fibrous substances.
2509. T. Molineux, 37, John Dalton-street, Manchester—Imp. in pianoforte actions.

Dated 12th September, 1862.

2511. A. E. H. B. Butler, Kirkstall Forge Company, Leeds—Imp. in machinery for straightening and polishing cylindrical bars of iron and other metals.
2512. J. B. Smith, Bury—Certain imp. in washing and mangling machines, applicable in part to steam dyeing and to bleaching.
2513. J. Thom, Canterbury-place, Lambeth, Surrey — Imp. in mounting or fitting artificial teeth.
2514. J. R. Johnson, Stanbrook-cottage, Hammersmith, and J. S. Atkinson, 31, Red Lion-square – Imp. in machinery for manufacturing printing types.
2515. J. Bower, Carlow—Imp. in railway sleepers.
2517. J. Howie, Hurlford, Ayr, N.B.—Imp. in the construction of crossings and switches of railways.
2519. H. Higgins, Salford—Imp. in machinery or apparatus for opening, cleansing, or carding cotton and other fibrous materials.

Dated 13th September, 1862.

2521. W. Harkes, Lostock Gralam, Chester—Imp. in machinery for mowing and reaping.
2523. M. Chadwick, Chapel Field, near Manchester—Imp. in machinery for doubling, folding, or plaiting cloth or other woven fabrics.
2525. T. W. Cowan, Greenwich—Imp. in the construction of portable or fixed pumps.
2527. H. Bennett, Wombridge Iron Works, Shropshire—Imp. in machinery or apparatus for the rolling of wire rods.

Dated 15th September, 1862.

2529. E. G. Chant, London—Imp. in self-binding portfolios or holders for newspapers, music, documents, letters, and other papers, or for woven and other fabrics which it may be desired to bind or hold together.
2533. W. L. Tizard, Mark-lane—Imp. in the construction of ships, vessels, cupolas, and forts, and in apparatus employed therein.
2535. J. Webster, Birmingham—Imp. in the manufacture of nitric and nitrous acids, and other nitrogenous compounds.

Dated 16th September, 1862.

2537. J. Whines, Pimlico—Improved machinery for filling dipping clamps with tapers and match splints.
2539. J. G. Bunting, 4, Trafalgar-square, Charing-cross—A mechanical horse break.
2541. S. Flexen, Braziers'-buildings, Farringdon-street—Imp. in apparatus for ventilating railway and other carriages.
2543. R. Moreland, jun., 5, Old-street, St. Lukes—Imp. in machinery for preparing and cutting hops,
2545. H. Jordan, Southampton—Imp. in rotatory engines.

Dated 17th September, 1862.

2547. L. Leigh, Manchester—Imp. in certain machinery for stretching and glossing silk, wool, and other fibrous materials.
2549. R. Cranston, London, Edinburgh, and Glasgow—An improved washing machine.
2550. J. Simpson, Hulme, Lancashire—An improved composition for coating or covering moulded or other surfaces, and in apparatus for applying the same thereto.
2551. W. E. Newton, 66, Chancery-lane—Imp. in watches or time-keepers. (A com.)
2553. J. Douglas, Blackfriars-road—Imp. in apparatus applicable to close fire ranges usually termed kitcheners, for the purposes of ventilation.
2555. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in gas burners. (A com.)

Dated 18th September, 1862.

2558. R. Kay, Castleton Print Works, Blue Pits, Lancashire—Certain imp. in printing calico and other surfaces, and in apparatus connected therewith.
2560. W. H. Browne, Theobalds-road, and H. Armstrong, Manchester-street—Imp. in dry and wet gas meters.
2562. J. W. Woodford, 12, Sutherland-street, Walworth—Imp. in machinery and apparatus used for driving and drawing piles, also for raising soil, and also in shoes and hoops for piles.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

2602. W. Clark, 53, Chancery-lane—Imp. in signalling. (A com.)—24th September, 1862.
2612. M. A. F. Mennons, 24, Rue du Mont Thabor, Paris—Imp. in the construction of chair settees. (A com.)—25th September, 1862.

PATENTS SEALED.

[*From Gazette, October 3rd*, 1862.]

October 3rd.

956. T. Silver.
959. G. Moulton.
963. S. Fielding, S. Fielding, jun., R. Fielding, and T. Fielding.
964. R. A. Brooman.
972. W. Begg.
974. J. Colling.
975. A. Clark.
976. L. Faconnet.
977. R. A. Zobitzsch.
980. C. S. Duncan.
982. W. Simons.
985. G. Haseltine.
987. T. Jackson.
991. J. Brown.
997. F. W. Brearey.
998. E. H. C. Monckton.
999. J. Jaques, jun.
1000. B. Sharpe.
1004. J. Wright.
1005. T. Cobley and J. Wright.
1007. J. E. H. Andrew.
1009. G. Hollinshed.
1010. J. Bullogh and J. Bullogh.
1011. W. Taylor.
1013. J. Jones.
1014. J. Langston.
1016. J. Knowelden.
1023. W. Nunn.
1024. J. Houghton.
1027. C. P. Coles.
1030. H. Deacon.
1033. G. Burge.
1034. C. Bartholomew and J. Heptinstall.
1037. W. Fox.
1043. W. E. Gedge.
1045. F. Rigollot.
1049. W. Clark.
1054. J. Bunnett.
1065. F. Tolhausen.
1069. J. K. Hampshire.
1071. C. Harratt.
1085. G. Bedson.
1088. R. A. Peacock.
1188. W. E. Newton.
1202. R. Mushet.
1224. W. E. Newton.
1262. W. E. Newton.
1285. W. E. Newton.
1319. S. Merolla.
1320. W. E. Newton.
1646. J. Betteley.
1731. J. Alison.
1857. E. C. Nicholson.
1877. J. B. Coquatrix.
2162. W. Wanklyn.
2189. J. Briggs.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, October 7th*, 1862.]

September 29th.

2218. W. H. Buckland.

30th September.

2228. A. S. Stocker.
2286. W. Brookes.

2nd October.

2262. W. E. Newton.
2263. W. E. Newton.

3rd October.

2267. J. Macintosh.
2269. J. Macintosh.
2274. E. O'Connell.
2313. A. Whytock.

4th October.

2277. W. Macfarlane.
2283. W. E. Newton.
2306. C. F. Beyer.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[*From Gazette, October 7th*, 1862.]

29th September.

2191. J. R. Musgrave, R. Musgrave, and J. Musgrave.

30th September.

2184. W. Kempe.

2267. J. Thornton, A. Thornton, W. Thornton, and H. Thornton.

3rd October.

2230. T. Dickens.
2232. F. C. Lepage.